

## CLAIMS

1. A method of determining each of a plurality of data symbols or codewords from a plurality of signals comprising the steps of:

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(i) weighting a number of said signals so as to substantially null said number of signals, using weighting means;

(ii) determining a symbol or codeword associated with a, or each, non-nulled signal using processing means arranged to execute a maximum likelihood estimation process upon said, or each, non-nulled signal;

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(iii) reducing the number of signals nulled by the weighting means by at least a number of non-nulled signals in step (ii);

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(iv) altering a maximum likelihood metric in accordance with the data symbol derived at step (ii); and

(v) repeating steps (ii) to (iv).

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2. The method of claim 1 including selecting signals with highest input power to be nulled at either, or both, of steps (i) and (iii)

3. The method of either of claims 1 or 2 including separating frequencies of at least some of the plurality of signals by multiples of a harmonic frequency.

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4. The method of any preceding claim including orthogonalising each of the plurality of signals.

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5. The method of any preceding claim including transmitting the plurality of signals at a range of frequencies from a plurality of spatially separated transmitters.
- 5 6. The method of any preceding claim including providing a plurality of receivers arranged to receive said plurality of signals prior to step (i).
7. The method of any preceding claim including determining symbols that are, or form part of, codewords, the codewords being associated  
10 with streams of symbols input to a transmitting means.
8. The method of any preceding claim including deriving a matrix of complex weighting co-efficients by the processing means to be either of steps (i) or (iii).applied to said weighting means in order to null said  
15 signals at
9. The method of any preceding claim including sampling channel state information data to determine which signals are to be nulled at either, or both, of steps (i) and (iii).
- 20 10. The method of any preceding claim including using the vector Viterbi algorithm at step (ii).
11. A signal receiving apparatus comprising a plurality of receiving  
25 elements, weighting means, and decoding means, each of the receiving elements having respective weighting means associated therewith, each of the receiving elements being arranged to receive a plurality of signals transmitted from a plurality of transmitters, the weighting means being arranged to apply a complex weighting function to each of a number of  
30 said signals received by the receiving elements at a given frequency in order to null said number of said signals, the decoding means being

arranged to determine a symbol or codeword associated with a non-nulled signal and to incorporate said symbol or codeword in the determination of at least one further symbol or codeword.

5 12. Apparatus according to claim 11 including at least four receiving elements.

13. Apparatus according to either of claims 11 or 12 wherein each receiving element has a channel state information (CSI) unit arranged to  
10 compensate for distortion to the signal received by the apparatus due to variations in the transmission path of said signal associated therewith.

14. Apparatus according to any one of claims 11 to 13 including an FFT unit arranged to separate each of a plurality of sub-carrier signals  
15 from said received signals between each receiving element and the decoding means.

15. Apparatus according to any one of claims 11 to 14 wherein the decoding means include processing means arranged to carry out a  
20 maximum likelihood estimation procedure upon a sub-carrier signal received at a receiving element in order to determine the symbol or codeword.

16. Apparatus according to claim 15 wherein the processing means is  
25 arranged to carry out whole vector Viterbi decoding upon the signal.

17. Apparatus according to any one of claims 11 to 16 wherein the apparatus is arranged to execute the method of any one of claims 1 to 10

30 18. A method of increasing data transfer capacity across a network comprising the steps of:

- (i) receiving a signal comprising a plurality of data carrying sub-channels at a plurality of receiving elements;
- 5 (ii) suppressing a component of the signal associated with a given sub-channel received at all but one receiving element;
- (iii) determining a symbol or codeword associated with said signal received on said given sub-channel at said one receiving element using a  
10 maximum likelihood estimation process; and
- (iv) incorporating the symbol or codeword into the maximum likelihood estimation process for the determination of at least one other symbol or codeword.  
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19. The method of claim 18 including parallelising data and encoding the data as a symbol or a space time codeword prior to transmission of the symbol or codeword over the network.
- 20 20. The method of either of claims 18 or 19 including providing more than four receiving elements arranged to receive the signal from the network.
21. The method of any one of claims 18 to 20 including applying a  
25 whole vector Viterbi decoding to the signal at step (iii).
22. The method of any one of claims 18 to 21 providing the network in the form of a wireless local area network or a mobile telecommunications network.

23. A computer readable medium having stored therein instructions for causing a device to execute the method according to any one of claims 1 to 10 or claims 18 to 22.
- 5 24. A program storage device readable by a machine and encoding a program of instructions which when operated upon the machine cause the machine to operate as the apparatus according to any one of claims 11 to 17.
- 10 25. A method of determining each of a plurality of data symbols or codewords from a plurality of signals substantially as hereinbefore described with reference to the accompanying drawings.
- 15 26. A signal receiving apparatus substantially as hereinbefore described with reference to the accompanying drawings.
27. A method of increasing data transfer capacity across a network substantially as hereinbefore described with reference to the accompanying drawings.